# SPECIFICATION

[ ◉ ] Preliminary Specification
[ ] Final Specification

**Description** **13.3” 1920xRGBx1080 TFT-LCD Module**

**Part Number** **P1330FHF1ME10**

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* This cover page is for your Comments and Signatures back to TIANMA.

# REVISION HISTORY

| Rev | Date | Page | Revision Items | Editor |
|---|---|---|---|---|
| 1.0 | 2021/07/11 | All | Preliminary release. | MingxuXiao |
| 1.1 | 2021/04/20 | Page4&16 | Add weight of LCM | Xuelian Xin |
| | | Page7 | Update backlight power supply current&voltge& consumption | |
| | | Page 15 | Update drawing of LCM | |
| | | Page 11 | Update chromaticity of white &Add min CR 700 | Jie Chen |
| | | Page4 | Update IC to RM91M39FK | Dong Qin |
| | | Page6 | Update Absolute Maximum Ratings& Electrical Characteristics | Dong Qin |
| | | Page10 | ADD 5.5 Timing | Dong Qin |
| 1.2 | 2021/09/07 | All | All: Update the model No. **P1330FHF1ME10** | Hongwei Liu |
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| | 2021/12/03 | Page 5 | Update LCD Power Consumption & Add note 5 | Zuying Zhang |
| | 2021/12/03 | Page 5 | Update 5.3 | Zuying Zhang |
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# 1. Summary

## 1.1 General Description

This is a 13.3 inch a-Si TFT-LCD module with Normal-black technology. It is composed of a TFT-LCD panel, a driver circuit, PCB, and a LED backlight unit.

## 1.2 Features

- Ultra-wide viewing angle
- High resolution
- Wide temperature range
- Interface: EDP 1.2
- LED driver integrated
- Surface treatment ; AG
- Acquisition product for UL62368-1/CSA C22.2 No.62368-1-03 (File number: E170632)
- Compliant with the European RoHS Directive (2011/65/EU) and Delegated Directive (2015/863/EU, Amending Annex II of 2011/65/EU)

## 2. General Specifications

| Feature | | Spec | Unit |
|---|---|---|---|
| **Display Spec** | Size | 13.3 inches | |
| | Resolution | 1920(RGB)x1080 | |
| | Pixel Pitch | 0.153x0.153 | mm |
| | TFT Active Area | 293.76x165.24 | mm |
| | Technology Type | a-Si | |
| | Pixel Configuration | R.G.B Vertical Stripe | |
| | Display Mode | TN, Normally Black | |
| | Surface Treatment | Anti-Glare | |
| | Viewing Direction | All | |
| | Gray Scale Inversion Direction | NA | |
| **Mechanical Characteristics** | LCM (W x H x D) | 305.35 x 178.56 x 3.7 | mm |
| | Weight | 346±5 % | g |
| **Optical Characteristics** | Luminance | 350 | $cd/m^2$ |
| | Contrast Ratio | 1000:1 | |
| | NTSC | 72 | % |
| | Viewing Angle | 88/88/88/88 | degree |
| **Electrical Characteristics** | Interface | EDP1.2 | |
| | Color Depth | 16.7 Million | color |
| | Power Consumption | LCD:2200;<br>Backlight:5184 | mW |

**Table 2.1 General TFT Specifications**

# 3. Input / Output Terminals

## 3.1 CN1 Pin assignment (LCD Interface)

| Connector Information | |
|---|---|
| LCD Module connector | IPEX 20455-030E-76 |

**Table 3.1.1 Connector information**

| No | Symbol | I/O | Description | Comment |
|---|---|---|---|---|
| 1 | NC | - | No connect | |
| 2 | GND | P | Ground | |
| 3 | D1- | I | eDP Rx lane 1, negative | |
| 4 | D1+ | I | eDP Rx lane 1, positive | |
| 5 | GND | P | Ground | |
| 6 | D0- | I | eDP Rx lane 0, negative | |
| 7 | D0+ | I | eDP Rx lane 0, positive | |
| 8 | GND | P | Ground | |
| 9 | AUX+ | I/O | Edp AUX ch, positive | |
| 10 | AUX- | I/O | Edp AUX ch, negative | |
| 11 | GND | P | Ground | |
| 12 | VCC | P | Power for LCD 3.3V | |
| 13 | VCC | P | Power for LCD 3.3V | |
| 14 | NC | - | No connect | |
| 15 | GND | P | Ground | |
| 16 | GND | P | Ground | |
| 17 | Edp_HPD | O | Hot Plug Detection | |
| 18 | PWM | I | BLU Diming | |
| 19 | NC | - | No connect | |
| 20 | VCC_LED- | P | BL Ground | |
| 21 | VCC_LED- | P | BL Ground | |
| 22 | VCC_LED- | P | BL Ground | |
| 23 | VCC_LED- | P | BL Ground | |
| 24 | VCC_LED- | P | BL Ground | |
| 25 | VCC_LED- | P | BL Ground | |
| 26 | EDP_LED_EN | I | BLU Enable | |
| 27 | NC | - | No connect | |
| 28 | VCC_LED+ | P | Power for BLU (12V type) | |
| 29 | VCC_LED+ | P | Power for BLU (12V type) | |
| 30 | NC | - | No connect | |

**Table 3.1.2 Pin Assignment for LCD Interface**

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection
Note2: All of the GND pins should be connected to the system ground.

## 4. Absolute Maximum Ratings

| Item | Symbol | MIN | MAX | Unit | Remark |
|---|---|---|---|---|---|
| Power Voltage | VCC | -0.3 | 3.6 | V | Note1 |
| BL_POWER Input | VCC_LED+ | -0.3 | 28 | V | |
| BL_PWM signal input | PWM | -0.3 | 5.5 | V | |
| BL ENABLE | EDP_LED_EN | -0.3 | 5.5 | V | |
| Operating Temperature | Top | -20 | 70 | ℃ | |
| Storage Temperature | Tst | -30 | 80 | ℃ | |
| Relative Humidity Note2 | RH | -- | ≤95 | % | Ta≤40℃ |
| | | -- | ≤85 | % | 40℃＜Ta≤50℃ |
| | | -- | ≤55 | % | 50℃＜Ta≤60℃ |
| | | -- | ≤36 | % | 60℃＜Ta≤70℃ |
| | | -- | ≤24 | % | 70℃＜Ta≤80℃ |
| Absolute Humidity | AH | -- | ≤70 | g/m³ | Ta＞70℃ |

**Table 4.1 Absolute Maximum Ratings**

Note1: Input voltage include all in put data.
Note2: Ta means the ambient temperature. It is necessary to limit the relative humidity to the specified temperature range. Condensation on the module is not allowed.
Note3: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed

# 5. Electrical Characteristics

## 5.1 DC Characteristics for Panel Driving

| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|---|---|---|---|---|---|---|
| Power Supply for LCD | VCC | 3.2 | 3.3 | 3.4 | V | |
| Hot plug Detect | Edp_HPD | - | 3.3 | - | V | TCON output HPD 3.3Vtyp |
| LCD Power Consumption | P_VDD | - | 2.2 | 2.5 | W | Test at White pattern |

**Table 5.1.1 Operating Voltages**

Note1: Indicated the subsequent version may be updated.

## 5.2 DC Characteristics for Backlight Driving

| Item | | Symbol | MIN | TYP | MAX | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Backlight power supply voltage | | VCC_LED+ | 11.5 | 12 | 12.5 | V | 10 LEDs (2 LED Parallel,5 LED Serial) |
| Backlight power supply current | | I VCC_LED+ | - | 432 | | mA | |
| Backlight power consumption | | P_LED | - | 5184 | | mW | |
| Input voltage for PWM signal | High level | - | 1.3 | - | 5 | V | |
| | Low level | - | 0 | - | 0.15 | V | |
| Input voltage for VLED_EN | High level | - | 1.6 | - | 5 | V | |
| | Low level | - | 0 | - | 1 | V | |
| VLED_PWM frequency | | Fpwm | 100 | - | 20k | HZ | |
| VLED_PWM duty | | D | 1 | | 100 | % | |
| LED life time | | - | - | 30000 | | H | |

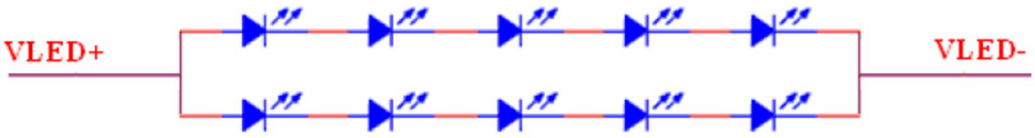
**Table 5.2.1 LED Backlight Characteristics**

Note1: $I_F$ is defined for each channel.

Note2: Optical performance should be evaluated at Ta=25℃ only.

Note3: If LED is driven by high current, high ambient temperature & humidity condition,The life time of LED will be reduced.

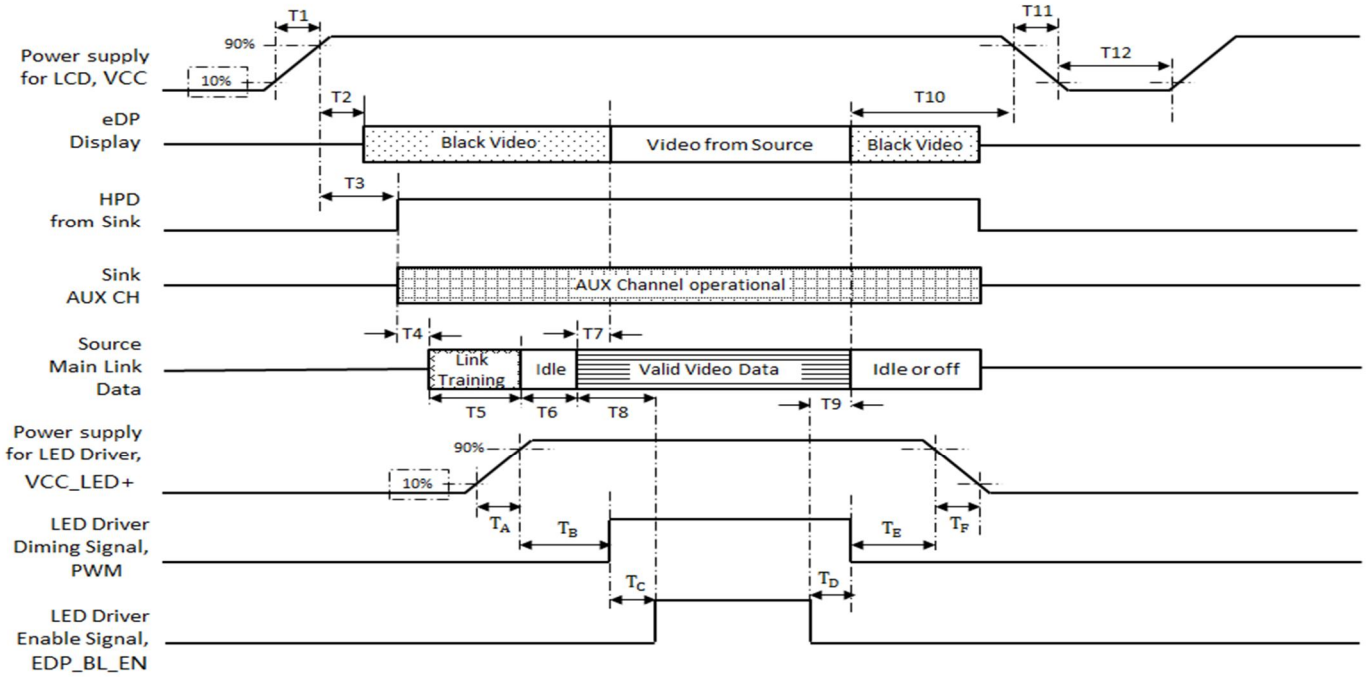
Note4: Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is estimated data.




Note5:

| Dimming Frequency (Hz) | Duty (Min.) | Duty (Max.) |
|---|---|---|
| $100 < f_{PWM} \leq 200$ | 0.16% | 100% |
| $200 < f_{PWM} \leq 500$ | 0.40% | 100% |
| $500 < f_{PWM} \leq 1k$ | 0.80% | 100% |
| $1k < f_{PWM} \leq 2k$ | 1.60% | 100% |
| $2k < f_{PWM} \leq 5k$ | 4.00% | 100% |
| $5k < f_{PWM} \leq 10k$ | 8.00% | 100% |
| $10k < f_{PWM} \leq 20k$ | 16.00% | 100% |

## 5.3 Recommended Power ON/OFF Sequence




| Parameters | Description | Reqd. by | Value | | Unit | Notes |
|---|---|---|---|---|---|---|
| | | | Min | Max | | |
| T1 | Power tail rise time, 10% to 90% | Source | 0.5 | 10 | ms | - |
| T2 | Delay from LCD VCC to black video generation | Sink | 0 | 200 | ms | Automatic Black Video generation prevents display noise until valid video data is received from the Source |
| T3 | Delay from LCD VCC to HPD high | Sink | 0 | 200 | ms | Sink AUX Channel must be operational upon HPD high |
| T4 | Delay from HPD high to link training initialization | Source | - | - | ms | Allows for source to read Link capacity and initialize |
| T5 | Link training duration | Source | - | - | ms | Dependent on Source link training Protocol |
| T6 | Link Idle | Source | - | - | ms | Min Accounts for required BS-Idle pattern. Max allows for Source frame synchronization |
| T7 | Delay from valid video Data from Source to video on display | Sink | 0 | 50 | ms | Max value allows for Sink to valid video Data and Timing. At the end of T7, Sink will indicate the detection of valid video data by setting SINK_STATUS bit to logic 1(DPCD 00205h, bit 0), and Sink will no longer generate automatic Black video |
| T8 | Delay from valid video Data from Source to Backlight on | Source | - | - | ms | Source must assure display video is stable |
| T9 | Delay from Backlight off to end of valid video Data | Source | - | - | ms | Source must assure backlight is no longer illuminated. At the end of T9, Sink will indicate the detection of no valid video data by setting the SINK_STATUS bit to logic 0 (DPCD 00205h, bit 0), and Sink will automatically display Black Video. |
| T10 | Delay from end of valid video data from Source to Power off | Source | 0 | 500 | ms | Black video will be displayed after receiving idle or off signals from Source |
| T11 | LCD VCC power rail fall time, 90% to 10% | Source | 0.5 | 10 | ms | - |
| T12 | LCD VCC Power off time | Source | 500 | - | ms | - |
| $T_A$ | VCC LED+ rail rise time, 10% to 90% | Source | 0.5 | 10 | ms | - |
| $T_F$ | VCC LED+ rail fall time, 90% to 10% | Source | 0.5 | 10 | ms | - |
| $T_B$ | Delay from VCC LED+ to Dimming signal PWM on | Source | 0 | - | ms | - |
| $T_E$ | Delay from Dimming signal PWM off to VCC LED+ off | Source | 0 | - | ms | - |
| $T_C$ | Delay from diming signal PWM on to Enable signal EDP_BL_EN | Source | 0.5 | - | ms | - |
| $T_D$ | Delay from Enable signal EDP_BL_EN off to diming signal PWM off | Source | 0.5 | - | ms | - |

Note1: T1< T2.
Note2: The low level of these signals and analog powers are GND level.
Note3: All of the power and signals should be kept at GND level before power on. If there are residual voltages on them, the LCD might not work properly.
Note4: The power on/off sequence is the first version. It will be updated when the design is fixed.
Note5: BL is the voltage applied to backlight. Keep it turned off until the display has stabilized.

## 5.4 LCD Module Block Diagram

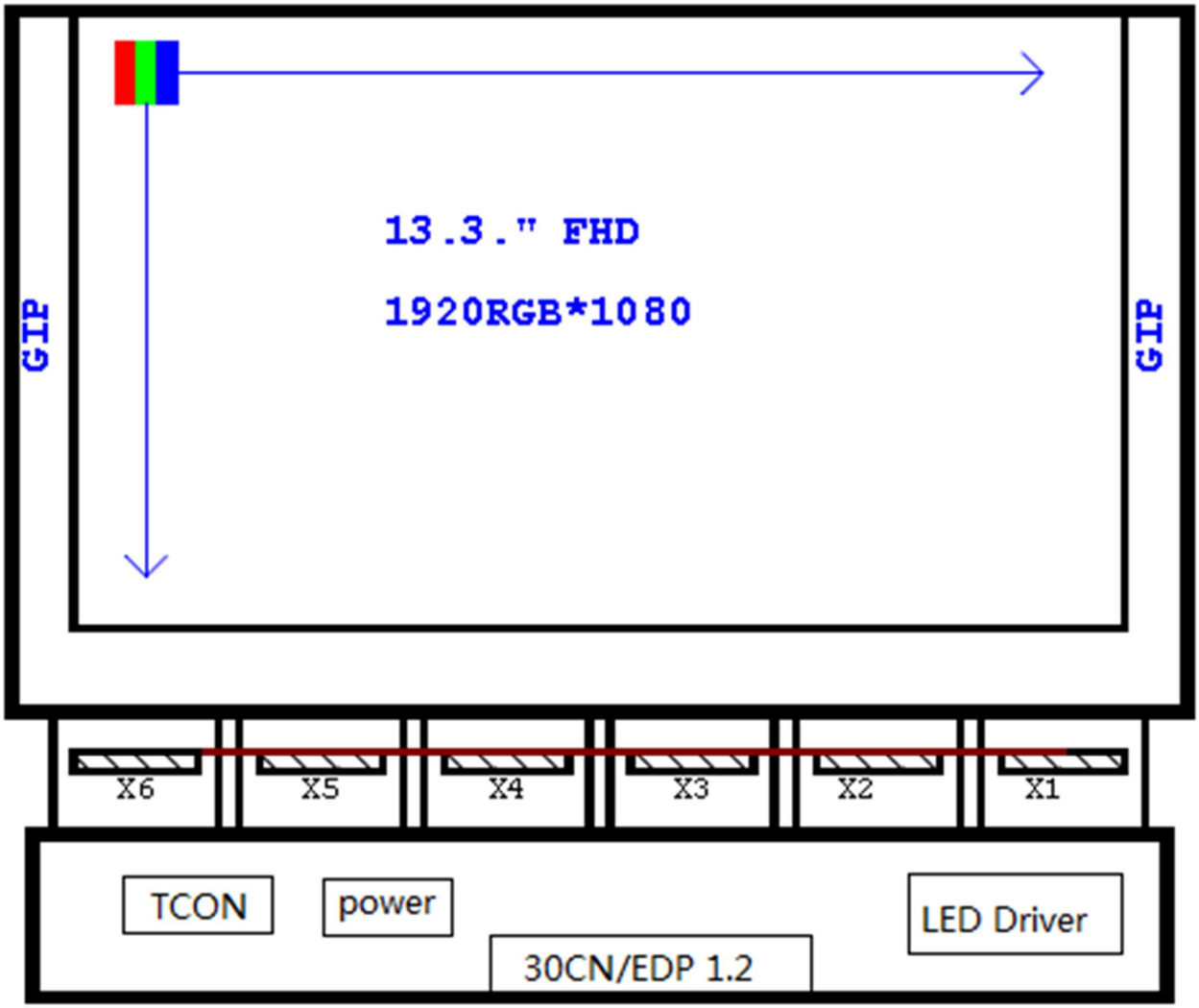
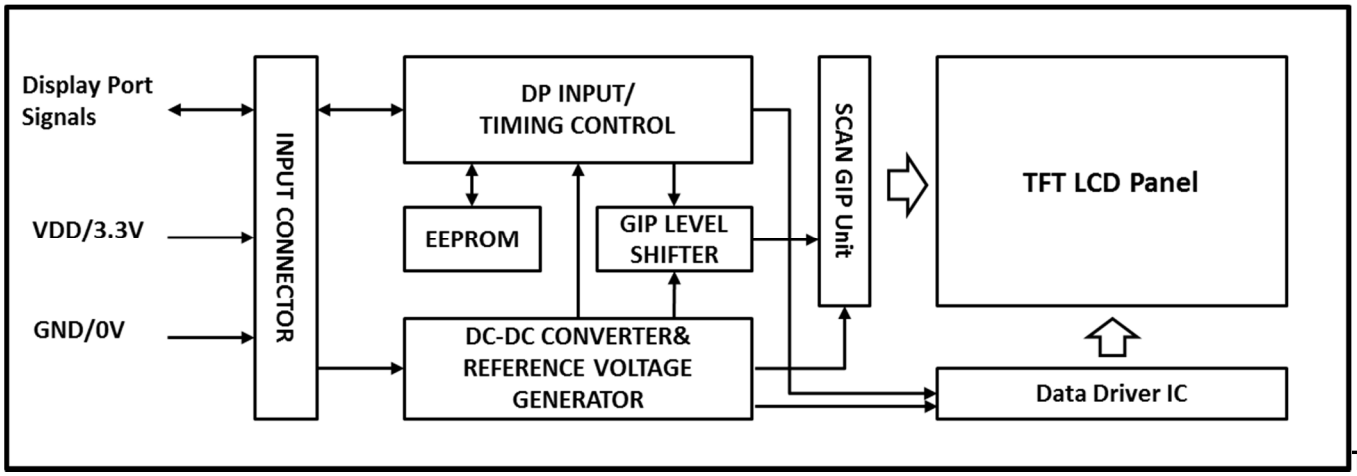



**Figure 5.5.1 LCD Module Block Diagram**

# 6. Timing Characteristics

## 6.1 Display Edp1.2 Reference Circuit




Table

## 6.2 EDP1.2 Data Format

| Lane 0 | Lane 1 |
|---|---|
| R0-7:0 | R1-7:0 |
| G0-7:0 | G1-7:0 |
| B0-7:0 | B1-7:0 |
| R2-7:0 | R3-7:0 |
| G2-7:0 | G3-7:0 |
| B2-7:0 | B3-7:0 |
| R4-7:0 | R5-7:0 |
| G4-7:0 | G5-7:0 |
| B4-7:0 | B5-7:0 |

**Table 6.2.1 24 bpp RGB Mapping to a Two Lane Main Link**

## 6.3 DP Characteristics

### 6.3.1 Aux Channel Characteristics

| Symbol and Parameter | | Test Conditions | Min | Typ[2] | Max | Unit |
|---|---|---|---|---|---|---|
| UI: | Unit Interval for AUX channel | | 0.4 | 0.5 | 0.6 | μs |
| $V_{AUX-TX\_DIFF-p-p}$: | AUX differential peak-to-peak voltage when driving (TX) | | 400 | | 1000 | mV |
| $V_{AUX-RX\_DIFF-p-p}$: | AUX differential peak-to-peak voltage when receiving (RX) | | 250 | | 1360 | mV |
| $V_{AUX-DC-CM-RX}$: | AUX common mode voltage when receiving | | | GND | | V |
| $V_{AUX-DC-CM-TX}$: | AUX common mode voltage when transmitting | | | 0.15 | | V |
| $I_{AUX-SHORT}$: | AUX channel short circuit current | | | | 20 | mA |
| $R_{AUX-DIFF}$: | Differential termination resistance | | 80 | 100 | 120 | Ω |
| $R_{AUX-SE}$: | Single-ended termination resistance | | 40 | 50 | 60 | Ω |
| $C_{AUX}$: | AUX AC coupling capacitor | | 75 | | 200 | nF |

### 6.3.2 Main Link Characteristics

| Symbol and Parameter | Test Conditions | Min | Typ[2] | Max | Unit |
|---|---|---|---|---|---|
| Spread spectrum clock, down-spreading by SOURCE | | | 0.5 | | % |
| $V_{RX-DIFFp-p}$: Differential peak-to-peak input voltage at package pins | | 100 | | 1320 | mV |
| Maximum adaptive/programmable equalization level at 1.35GHz | | | 9 | | dB |
| $V_{RX\_DC\_CM}$: Rx input DC common mode voltage | | | GND | | V |
| $R_{RX-DIFF}$: Differential termination resistance | | 80 | 100 | 120 | Ω |
| $R_{RX-SE}$: Single-ended termination resistance | | 40 | | 60 | Ω |
| $I_{RX\_SHORT}$: Rx short circuit current limit | | | | 20 | mA |
| $L_{RX\_SKEW\_INTRA\_PAIR}$: Intra-pair skew at Rx package pins (HBR) | | | | 150 | ps |
| RX intra-pair skew tolerance at HBR | | | | | |
| $L_{RX\_SKEW\_INTRA\_PAIR}$: Intra-pair skew at Rx package pins (RBR) | | | | 300 | ps |
| RX intra-pair skew tolerance at RBR | | | | | |
| Receiver Jitter Tolerance for High Bit Rate (HBR) | | | | | |
| Total jitter tolerance at 2MHz | | 1227 | | | mUI |
| Total jitter tolerance at 10MHz | | 548 | | | mUI |
| Total jitter tolerance at 20MHz | | 505 | | | mUI |
| Total jitter tolerance at 100MHz | | 491 | | | mUI |
| Receiver Jitter Tolerance for Reduced Bit Rate (RBR) | | | | | |
| Total jitter tolerance at 2MHz | | 1648 | | | mUI |
| Total jitter tolerance at 10MHz | | 778 | | | mUI |
| Total jitter tolerance at 20MHz | | 747 | | | mUI |

### 6.4 Timing

| Symbol | Typ | Unit |
|---|---|---|
| **PixelClock** | 139 | MHz |
| **HACT** | 1920 | PixelClock |
| **HBP** | 48 | PixelClock |
| **HFP** | 64 | PixelClock |
| **HSA** | 48 | PixelClock |
| **VACT** | 1080 | Line |
| **VBP** | 41 | Line |
| **VFP** | 3 | Line |
| **VSA** | 6 | Line |

## 7. Optical Characteristics

| Item | | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| **View Angles** | | θT | CR≧10 | | 88 | - | degree | Note2,3 |
| | | θB | | | 88 | - | | |
| | | θL | | | 88 | - | | |
| | | θR | | | 88 | - | | |
| **Contrast Ratio** | | CR | θ=0° | 700 | 1000 | - | | Note 3 |
| **Response Time** | | $T_{ON}$ | 25℃ | - | 25 | 35 | ms | Note 4 |
| | | $T_{OFF}$ | | | | | | |
| **Chromaticity** | **White** | x | Backlight is on | 0.243 | 0.293 | 0.343 | | Note 1,5 |
| | | y | | 0.253 | 0.303 | 0.353 | | |
| | **Red** | x | | 0.586 | 0.636 | 0.686 | | Note 1,5 |
| | | y | | 0.291 | 0.341 | 0.391 | | |
| | **Green** | x | | 0.28 | 0.33 | 0.38 | | Note 1,5 |
| | | y | | 0.575 | 0.625 | 0.675 | | |
| | **Blue** | x | | 0.103 | 0.153 | 0.203 | | Note 1,5 |
| | | y | | 0.024 | 0.074 | 0.124 | | |
| **Uniformity** | | U | | 75 | | - | % | Note 6 |
| **NTSC** | | - | | 67 | 72 | - | % | Note 5 |
| **Luminance** | | L | | 300 | 350 | | $cd/m^2$ | Note 7 |

Test Conditions:

1. $I_F$= **432** mA, and the ambient temperature is 25℃.
2. The test systems refer to Note1 and Note2.

Note1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical characteristics are measured at the center point of the LCD screen.

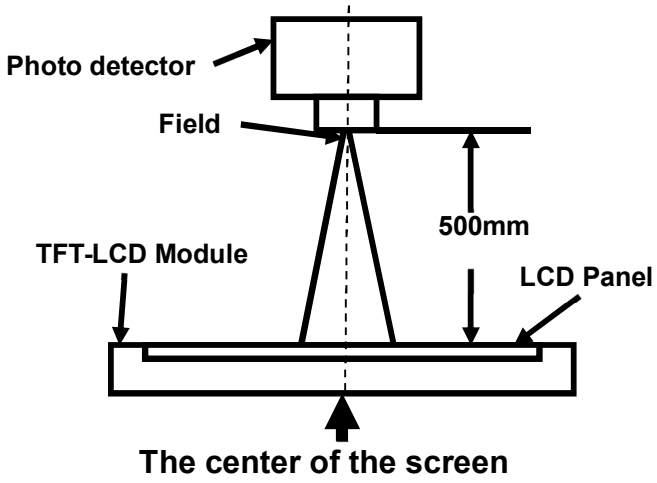



**Fig1. Measurement Set Up**

Note2: Definition of viewing angle range and measurement system. Viewing angle is measured at the center point of the LCD 。

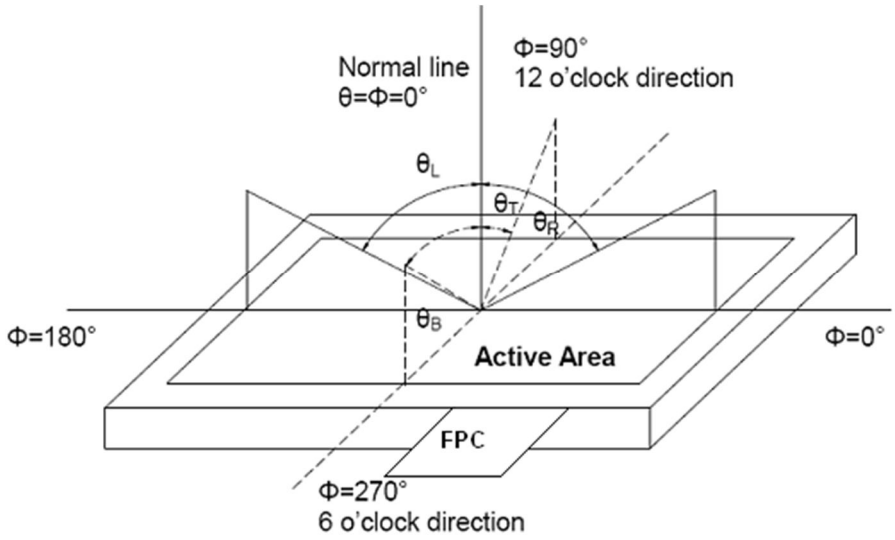



**Fig2. Measurement viewing angle**

Note3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

Note4: Definition of Response time

For TN LCM,the response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time ($T_r$) is the time between photo detector output intensity changed from 90% to 10%. And fall time ($T_f$) is the time between photo detector output intensity changed from 10% to 90%.

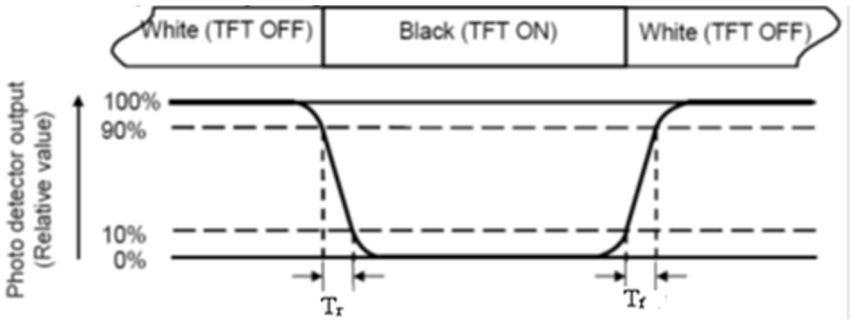



**Fig3. Response Time Testing(TN)**

For SFT LCM, the response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time ($T_r$) is the time between photo detector output intensity changed from 10% to 90%. And fall time ($T_f$) is the time between photo detector output intensity changed from 90% to 10%.

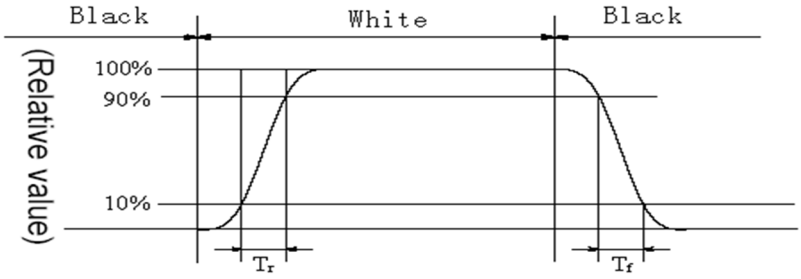



**Fig4. Response Time Testing(SFT)**

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig.5). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax

Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

L-------Active area length; W----- Active area width

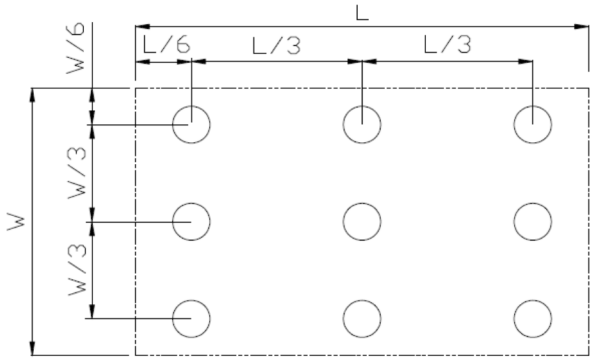



**Fig5. Luminance Uniformity Measurement Locations(9 points)**

Note7: Definition of Luminance:

Measure the luminance of white state at center point.

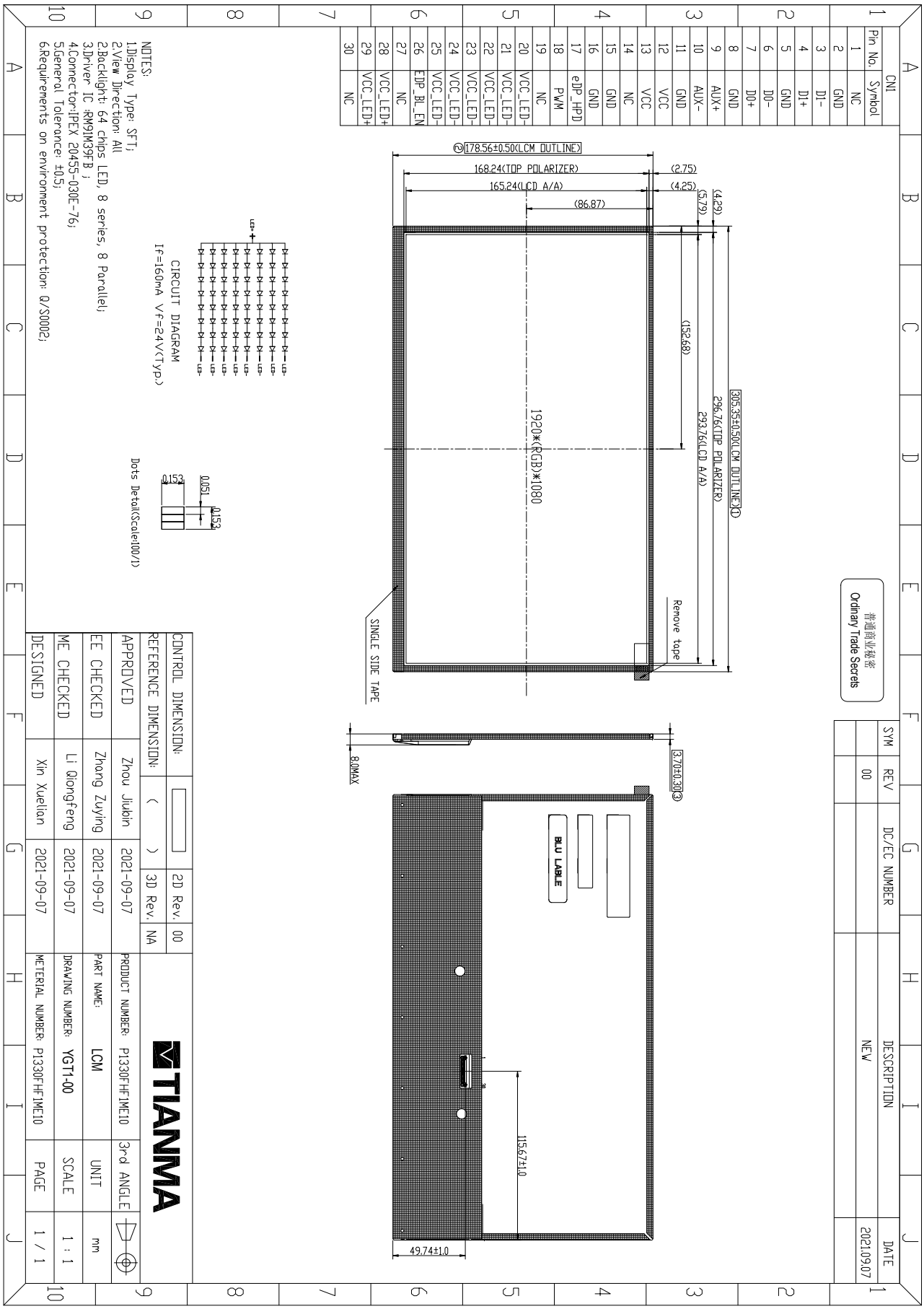
## 8. Reliability Test

| No | Test Item | Condition | Remarks |
|---|---|---|---|
| 1 | High Temperature Operation | +70℃，240H | IEC60068-2-1:2007<br>GB2423.2-2008 |
| 2 | Low Temperature Operation | -20℃，240H | IEC60068-2-1:2007<br>GB2423.1-2008 |
| 3 | High Temperature Storage | +80℃，240H | IEC60068-2-1:2007<br>GB2423.2-2008 |
| 4 | Low Temperature Storage | -30℃，240H | IEC60068-2-1:2007<br>GB2423.1-2008 |
| 5 | Storage at High Temperature and Humidity(non-operation) | +60℃，90%RH，240H | IEC60068-2-78 :2001<br>GB/T2423.3—2006 |
| 6 | Thermal Shock (non-operation) | -30℃，30min~80℃，30min，change time：5min，100cycle | Start with cold temperature,<br>End with high temperature,<br>IEC60068-2-14:1984,GB2423.22-2002 |
| 7 | ESD | C=150pF，R=330Ω，5point/panel<br>Air：±8kv，5times；<br>Contact：±4kv，5times；<br>（Environment：15℃~35℃，30%~60%，86Kpa~106Kpa） | IEC61000-4-2:2001<br>GB/T17626.2-2006 |
| 8 | Vibration (non-operation) | Frequency range:10～55Hz,<br>Stroke:1.5mm<br>Sweep:10Hz ～ 55Hz ～ 10Hz<br>2hours for each direction of X.Y.Z (6 hours total) | IEC60068-2-6:1982<br>GB/T2423.10—1995 |
| 9 | Shock (non-operation) | 60G 6ms, ±X,±Y,±Z 3 times for each direction | IEC60068-2-27:1987<br>GB/T2423.5—1995 |
| 10 | Package Drop Test | Height:60 cm,1 corner, 3 edges, 6 surfaces | IEC60068-2-32:1990<br>GB/T2423.8—1995 |

**Table 8.1 RA test condition**

Note1: Temperature is the ambient temperature of sample
Note2: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.
Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product's function only be guaranteed, but not for all of the cosmetic specification.

## 9. Mechanical Drawing

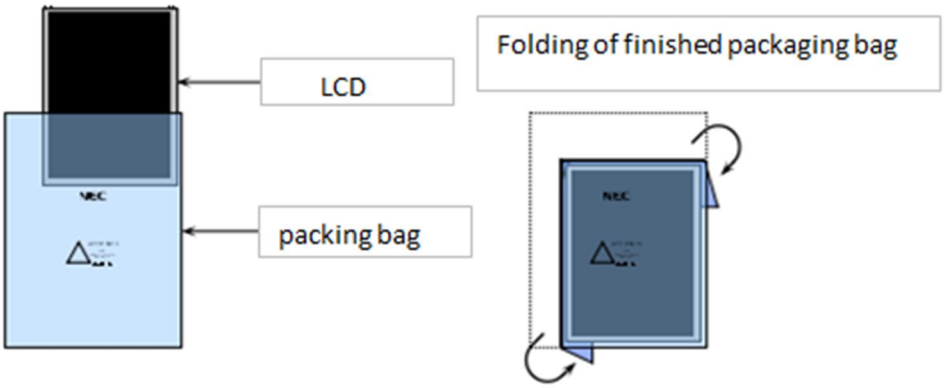


## 10. Packing Instruction

| No | Item | Model (Material) | Dimensions(mm) | Unit Weight(Kg) | Q'ty | Remark |
|---|---|---|---|---|---|---|
| 1 | LCM module | P1330FHF1ME10 | 305.35×178.56×3.7 | 0.3466 | 10 | |
| 2 | Partition broad | Corrugated paper | 362×179 | 0.033 | 2 | |
| 3 | Anti-static Bag | LD-PE | 360x255x0.05 | 0.015 | 10 | |
| 4 | EPP-Bottom | EPP | 444×415×170 | 0.253 | 1 | |
| 5 | EPP-TL | EPP | 444×154×120 | 0.086 | 1 | |
| | EPP-TR | EPP | 444×154×120 | 0.086 | 1 | |
| | EPE | EPE | 444×410×6 | 0.021 | 1 | |
| | Carton | Corrugated paper | 447×415×328 | 1.179 | 1 | |
| 6 | Total weight | **5.3±5%Kg** | | | | |

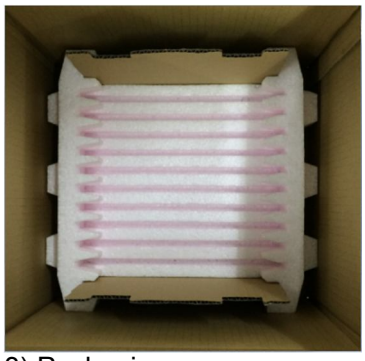
1. Single package

1) Put the LCD module into the packaging bag: as shown in the figure below
2) After the LCD module is put into the packaging bag of the finished product, the surplus part of the opening part is folded inward.
Note: the front of the module panel should be on the printed side of the packaging bag

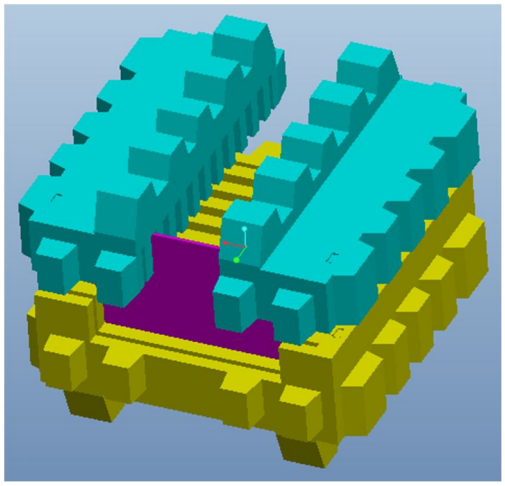



2. Inner packing
1) Packing preparation
Assemble the cardboard box, bind the bottom with tape, and put EPE into the carton, as shown in the figure below

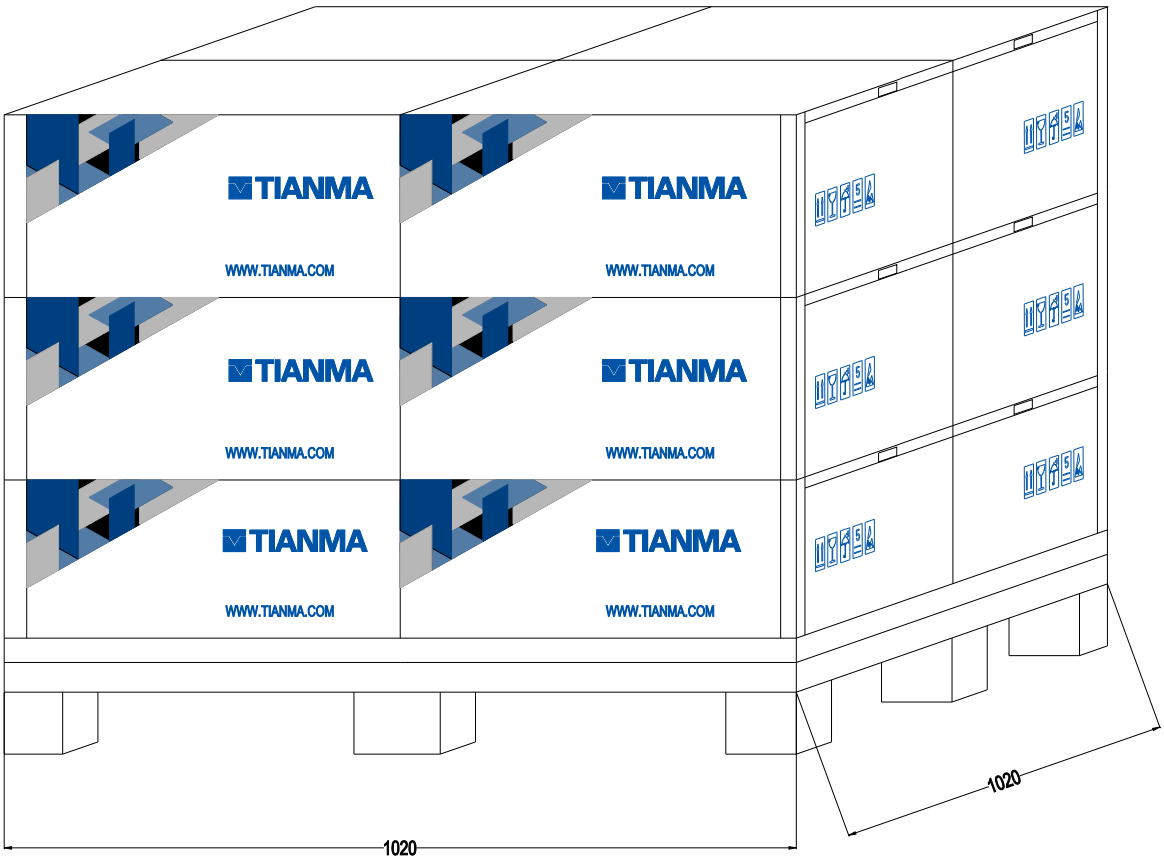
2) EPP bottom is placed on the top of EPE, and finally the clapboard is inserted into the grooves on both sides of the bottom plate, as shown in the figure below



3) Packaging
The module in the electrostatic bag should be put into the packing box according to the following conditions
a. When storing the work, take the finished product with both hands
b. PCB board side up
c. Place in the same direction
d. When the rest is only the remainder, it should be concentrated in the center of the box
After the packaging of the finished product is finished, put the upper left and right cover plates into the wall part of the component to press the finished product,
Note: the front (screen) of the module is consistent with the arrow direction above the EPP, as shown in the red circle below



4) Packing case sealing
Close the box cover and seal with tape
5) Label the box on the box
Label the carton on the short side of the carton (the side of the print number) above the item number, and align the left side with the left edge of the logo
6) Carton stack
The stacking number of cartons is 2 * 2, each layer * is 3layers




# 11. Precautions for Use of LCD Modules

## 11.1 Handling Precautions

(1) The display panel is made of glass. Do not subject it to mechanical shock by dropping it, etc.
(2) If the display panel is damaged and the liquid crystal fluid inside it leaks out be sure not to get any in your mouth. If the fluid comes into contact with your skin or clothes promptly wash it off using soap and water.
(3) Do not apply excessive force to the display surface or the bezel since this may cause the color tone to vary.
(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle the polarizer carefully.
(5) If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear use a moist cloth with one of the following solvents:
   — Isopropyl alcohol
   — Ethyl alcohol

   Solvents other than those mentioned above may damage the polarizer. Specifically, do not use the following:
   — Water
   — Ketone
   — Aromatic solvents
(6) Do not disassemble the LCD Module.
(7) If powered off, do not apply the input signals.

(8) To prevent destruction of the module by static electricity, be careful to maintain an optimum work environment.
(9) Be sure to ground your body when handling the LCD Modules.
(10) Tools used for assembly, must be properly grounded.
(11) To reduce the amount of static electricity generated, do not conduct assembly or other work under very low humidity conditions.
(12) The LCD Module is covered with a film to protect the display surface, remove film slowly under the ionizer.

### 11.2 Storage precautions

(1) When storing the LCD modules avoid exposure to direct sunlight or to the light of fluorescent lamps.
(2) The LCD modules should be stored within the rated storage temperature range. The recommend condition is: Temperature: 0 ~ 35 ℃ at normal humidity.
(3) The LCD modules should be stored in a room without acid, alkali or other harmful gas.

### 11.3 Transportation Precautions

The LCD modules should not be dropped or subject to violent mechanical shock during transportation. Also they should avoid excessive pressure, water, high humidity and direct sunlight.

### 11.4 Screen saver Precautions

Not display the fixed pattern for a long time. Use a screen saver, if the fixed pattern is displayed on the screen

### 11.5 Safety Precautions

(1) When you waste damaged or unnecessary LCDs, it is recommended to crush LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned
(2) Be sure to turn off the power supply when inserting or disconnecting the LED backlight cable.
(3) LED driver should be designed to limit or stop its function when over current is detected on the LED.